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Résumé

Cette étude propose l'analyse des déterminants des marges prix-coût pour les pays de l'OCDE entre 1970 et 2003. L'objectif principal est de quantifier l'effet pro-concurrentiel du commerce international et de comprendre pourquoi, malgré l'ouverture commerciale croissante, les marges n'ont pas baissé en général. Une augmentation d'un point de pourcentage du taux de pénétration des importations est estimée entraîner une baisse d'environ 0,005 de la marge : en moyenne, les importations ont contribué à une baisse importante de 0,042 des marges. De plus, la dérégulation domestique du marché des produits a réduit les marges. Cependant, ces effets sont contrebalancés par l'impact des exportations, de la financiarisation de l'économie et de la désinflation. La participation syndicale semble liée négativement aux taux de marge.

Mots clés : Marges prix-coût, Effet pro-concurrentiel, Négociations salariales, Panel dynamique

Abstract

This study analyzes the determinants of price-cost margins (PCMs) for OECD countries between 1970-2003. The main objective is to quantify the pro-competitive effect of international trade and understand why, despite trade liberalization, PCMs have not fallen overall. An increase of one percentage point in the import penetration ratio is estimated to lower the PCM by around 0.005: on average, imports contributed to a large decrease of 0.042 in the PCM. In addition, domestic product market deregulation has reduced PCMs. However, these effects are countervailed by the impacts of exports, financial deepening and disinflation. Union participation seems negatively related to PCMs.

Keywords: Price-cost margin, Pro-competitive effect, Wage bargaining, Dynamic panel

JEL Classification: F12, F16, L11, L13, L60, J50

1. Introduction

Classical trade theory teaches that international trade reduces markups through the so-called pro-competitive effect. The price-elasticity of demand perceived by domestic firms increases with foreign competition, which gives them an incentive to cut their margin. However, this theoretical effect does not square with the raw data. Figure 1 plots the price-cost margin (PCM) and the import penetration ratio at aggregated manufacturing level for seventeen OECD countries from 1970: at first sight, trade developments do not seem to have the expected effect on PCMs.[1] Indeed, the negative correlation between the two series is apparent for Japan and Spain only. Does this mean that the pro-competitive effect does not materialize or that there are counterbalancing phenomena?

In October 2003, the European Commission (2003) conducted a survey of 7 515 people in the 15 EU member states on the perception of globalization. Although 63% of the respondents were in favor of globalization, the answers revealed that conflicts of interests are prevalent and that the worker-consumers do not perceive to benefit fully from the deeper integration of economies. Indeed, the majority would like to see the changes listed in Table 1: an increased influence of trade unions and consumer associations and a diminishing role of multinationals and financial circles. Obviously, this survey catches perceptions only, and perceptions need not reflect reality. However, following Paul Krugman's first "commandment" (http://www.wws.princeton.edu/~pkrugman/howiwork.html) to listen to the Gentiles, one might at least wonder whether these dissatisfactions are related to the PCM puzzle.

In fact, most empirical studies supporting the import-as-market discipline assumption focus on developing countries experimenting trade liberalization. Roberts and Tybout (1996) provides an extensive survey, which is enriched by recent papers including Krishna and Mitra (1998) for India and Pavcnik (2002) for Chile. Two exceptions are Kee and Hoekman (2003, hereafter KH) and Chen, Imbs and Scott (2004, hereafter CIS).

KH investigate the impact of imports and competition law on industry markups using the UNIDO database and Hall's (1988) methodology. They estimated that an increase of 10% in the ratio of imports to production would lower the markup by around 0.014. However, their approach raises three

[1] The definition of the variables is given in Section 3.

issues. First, the dependent variable is the growth rate of real value added, and not that of real output, due to data limitations. Second, the UNIDO database provides data in current dollars only, while Hall-type estimates are extremely sensitive to the price indices used to compute real variables. Third, KH infer theoretically a non-linear relationship between markup and the ratio of imports to production, *m*. However, they treat this non-linearity by estimating a specification in which the markup depends linearly on the logarithm of *m*. There is no way that a doubling of the import ratio from 0.1% to 0.2% will have the same impact as a doubling from 10% to 20% for instance (their *econometric specification* implies that $\partial markup / \partial m = constant / m$ and, therefore, that the derivative of the markup with respect to the import ratio is infinite when the import ratio approaches zero, which is inconsistent with their model and with all the generalizations I could think of. In fact from their *model*, it can be shown that $\lim_{m \to 0} \partial markup / \partial Logm = 0$).

Unfortunately, this choice is not innocuous. Running the fixed-effect estimator on the UNIDO database limited to OECD countries with the PCM, defined below, as the dependent variable leads to the following inferences. Although the logarithm of *m* was significant and of the same magnitude as found by KH, *m* or other less extreme non-linear functions tested were not. Going further into details, the $Log(m)$ parameter is divided by 4 when the 41 highest markup observations out of a total of 7 082 are excluded, 39 of them come from the tobacco industry in Austria, Korea and Norway where markups were between 300% and 630% and import penetration of less than 0.1% in five cases, not to mention their negligible output weight.[2] In other words, the $Log(m)$ specification gives far too much weight on “small *m* – high markups” observations, which distorts the estimates.

CIS is a very stimulating paper attempting to assess the impact of imports on sectoral prices, disentangling the effects on productivity and markup. The key source of their data is Eurostat, but they also use for markups a fairly small sample of 418 observations from the BACH database. As CIS use the logarithm of the import ratio as their trade variable, the same limitation as for the KH study applies, especially as the import share ranges from 0.5% to 1291% in their sample. Nevertheless, they convincingly show that imports have a negative impact on sectoral prices and a positive one on

[2] In addition, these particular series are inconsistent with the STAN database, probably because of high tax levels.

productivity in the long-run. Incidentally from their estimates, only a fourth, at most, of sectoral productivity gains are passed on in prices. Also and close to KH, a 10% increase in the ratio of imports would lower the markup by around 0.01.

Recently, Broda and Weinstein (2004), using disaggregated data on imported products to the USA, found that the elasticity of substitution between varieties had decreased since 1972, from which they infer an increase in markups, consistent with Figure 1. Boulhol (2005), focusing on sectoral markup trends for OECD countries, finds no evidence of an average decrease in PCMs. More precisely, a strong pattern of convergence in PCMs, both across sectors and countries, is exhibited.[3] This pattern results from a decrease in initially high PCMs *and* an increase in initially low PCMs. Better financial market efficiency might be a driving force in markup convergence, as it facilitates the convergence in the rates of return on equity across sectors and countries. Moreover, inspired by Blanchard (1997), the author suggested that the erosion of workers' bargaining power would reconcile lower markups, not lower PCMs and decreasing manufacturing labor share.

There is now extensive literature recognising that wages are partly determined by rent-sharing between capital holders and workers. Oliveira Martins (1994) insists on market structure to infer the impact of international trade on wages. Moreover, Borjas and Ramey (1995) establish both the presence of significant rents captured by workers and the negative impact of imports on wages in concentrated sectors, especially those of lower educated workers. More recently, Kramarz (2003) shows that outsourcing weakens the bargaining position of high-school graduate workers by limiting the availability of alternative jobs. Since competition affects rents, it is of critical importance to account for labor market imperfections, especially as labor market institutions have evolved substantially. On the theoretical front, Rodrik (1997) was probably the first to promote the idea that imports could lower workers' bargaining position by making domestic and foreign labor more substitutable. More recently, Blanchard and Giavazzi (2003) develop a model to capture the outcomes of product and labor market deregulations. They infer that the bargaining power of workers has most likely declined since the middle of the 'eighties and show how product market deregulation may trigger labor market deregulation.

[3] The convergence of PCMs is consistent with Domowitz, Hubbard and Petersen (1986) studying US firms between 1958-1981.

From another perspective, Sutton (1991, 1997) insists on the endogeneity of market structure, which entails a non-monotonic relation between the intensity of competition and the concentration ratio of certain types of industries, working through the exit of firms unable to keep the pace. Moreover, the impact of trade on market structure is central in the burgeoning literature on firm heterogeneity. Bernard, Eaton, Jensen and Kortum (2003) highlight that imports induce the exit of the least efficient firms, leaving only the most productive higher-markup firms in the market. In Melitz (2003), export opportunities are driving the reshuffling of production at sector level.

The objective of this study is to provide a better understanding of why, despite trade liberalization, PCMs, at OECD sector level, have not fallen in general. Following the discussion above, determinants of PCMs should include labor and financial market features. In addition, because firms may be slow to adjust their prices to factor cost pressure, inflation is likely to be negatively related to PCMs. Taking into account the cyclical behavior of markups, imports are shown to have a robust and strong negative effect on PCMs. On average for manufacturing across countries, the increase in imports is estimated to have reduced the PCM index by 0.04, from an average level of around 0.12. In addition, domestic product market deregulation has reinforced this trend towards lower markups. However, these pro-competitive effects are counter-balanced by the positive impacts on the PCMs of increased exports, financial market development and disinflation. Moreover, union participation is negatively linked to PCM, consistent with its relation to workers' bargaining position. On the other hand, employment protection seems positively related to PCM, probably because it raises non-wage costs, but this impact has low significance. Finally, because of the strong heterogeneity of labor market institutional changes between countries, the average effect of labor market trends across countries is not meaningful.

The paper is organized as follows. The next section develops a model leading to the expression of the PCM with fairly general assumptions: differentiated goods, firm heterogeneity, foreign competition, conjectural variations and imperfect labor market. Section 3 focuses on the econometric specification and results are presented in Section 4. Section 5 concludes.

2. Model

2.1 Perfect labor market

The economy of a given country is composed of J sectors. The utility of the representative agent is CES of elasticity s and depends on the consumption C_j of the differentiated good *j* for *j = 1, 2,…,J*, according to:

$$U = \left(\sum_j a_j . C_j^{(s-1)/s} \right)^{s/(s-1)} \quad , \; a_j \geq 0 \tag{1}$$

Each variety *l* of good *j* is produced by one firm only, and s_j is the constant elasticity of substitution between varieties:

$$C_j = \left(\sum_l C_{jl}^{(s_j - 1)/s_j} \right)^{s_j/(s_j - 1)} \quad , \quad s_j > s \quad \forall\, j \tag{2}$$

For each variety, the production function is assumed to be homogenous of degree r_j in the variable factors: labor *N*, of price *w,* and other variable inputs I of price *q*.[4] Taking factor prices as given, the domestic frm *l* of sector *j* maximizes its profit by setting its price p_{jl} as a markup m_{jl} over its marginal cost, and produces Y_{jl}. First-order conditions and Euler's equation leads to the markup equation:

$$p_{jl} Y_{jl} = m_{jl} / r_j \,.\, VARCOST_{jl} = m_{jl} / r_j \,.\, (wN_{jl} + qI_{jl}) \tag{3}$$

where $VARCOST$ is the variable cost. The PCM, defined as Schmalensee (1989, p.960) reminds us as the difference between revenue and variable cost over revenue, is then derived:

$$PCM_{jl} \equiv \frac{p_{jl} Y_{jl} - (wN_{jl} + qI_{jl})}{p_{jl} Y_{jl}} = 1 - \frac{r_j}{m_{jl}} \tag{4}$$

The aggregated PCM at the sector level is obtained by weighting each firm *l* PCM by its share x_{jl} in sector *j* domestic output. Appendix 1 establishes that:

$$PCM_j \equiv \sum_{l \in \, domestic\, firms} x_{jl} . PCM_{jl} = r_j . L_j + (1 - r_j) \tag{5}$$

where the "aggregated Lerner index" L_j is given by:

[4] I and q can be seen as vectors.

$$L_j = \frac{1}{s_j} + \left(\frac{1}{s} - \frac{1}{s_j} \right) g_j . H_j .(1 - q_j) \tag{6}$$

q_j being the import ratio of sector *j* defined as the ratio of imports over the sum of imports and domestic production, H_j the Herfindahl index for domestic production and g_j an aggregated indicator measuring the intensity of competition. More precisely g_j is a weighted average of the g_{jl}, related to the conjectural variations $\partial Y_{jk} / \partial Y_{jl}$ according to:

$$g_{jl} = \left(\sum_{k \in all\ firms} \frac{\partial Y_{jk}}{\partial Y_{jl}} . \frac{p_{jk}}{p_{jl}} \right) \tag{7}$$

$$g_j = \sum_{l \in domestic firms} g_{jl} . x_{jl}^2 \ / \sum_{l \in domestic firms} x_{jl}^2 \tag{8}$$

Under constant returns to scale (CRS), equation (5) states that the PCM collapses into the Lerner index. To facilitate the interpretation of equation (6), consider two simplified cases. First, with Cournot competition, $\partial Y_{jk} / \partial Y_{jl}$ equals one if $k = l$ and zero otherwise. Then, both g_{jl} and g_j equals one. Second, in the case of identical firms either in autarchy or in the integrated equilibrium, g_{jl} becomes $g_{jl} = \partial Y_j / \partial Y_{jl} = g_j$ where Y_j is the total available production, domestic plus imports, of sector *j*. In this case, g_j ranges from *0* if competition is Bertand to *1* if Cournot.

Moreover, equation (6) generalizes two well-known cases with identical firms. The first is Cournot competition ($g_j = 1$) for a homogenous good ($s_j = \infty$): $L_j = (1 - q_j)/(N.s)$ where *N* is the number of domestic firms. The second is Dixit-Stiglitz case of monopolistic competition ($H_j = 0$): $L_j = 1/s_j$. More generally, the more substitutable the goods, the fiercer the competition, the less concentrated domestic production or the greater the import penetration, the lower the PCM is. The pro-competitive effect of international trade can be measured by the sensitivity of the PCM to the import ratio:

$$\partial PCM_j / \partial q_j = -r_j .(1/s - 1/s_j).g_j .H_j \tag{9a}$$

Table 2 gives some order of magnitude for reasonable values of the parameters, with a Cobb-Douglas utility function and CRS. For example, with an elasticity of substitution between varieties of *8*, Cournot competition and a Herfindahl index of *0.2*, an increase in the import ratio of *0.1* induces a decrease of *0.018* in the Lerner index.

Of course, equation (9a) only holds if the concentration level, *H*, is constant. The work by Sutton (1991, 1997) insists on the endogeneity of market structure. An increase in the competitive environment may trigger an endogenous reaction of firms, through an increase in R&D or advertisement spending for instance, which forces out the firms unable to keep the pace. Also, but not necessarily related, the merger and acquisition wave of the 'nineties gives an example of an endogenous reaction of firms aiming at improving their market power. Also, if imports generate a reshuffle of domestic production, as in Bernard et al., leading to the exit of the least efficient firms, which are likely to be the smallest, the Herfindahl index will increase as a result, and the pro-competitive effect will be dampened:

$$\partial PCM_j / \partial q_j = -r_j . (1/s - 1/s_j).g_j.[H_j - (1-q_j)\partial H_j / \partial q_j] \tag{9b}$$

2.2 Wage bargaining

Introducing labor market imperfections modifies the relationship between PCM and markup. There are usually two main ways to model wage bargaining, right-to-manage and efficient bargaining. Under the right-to-manage model, the firm and workers bargain over wages first and, in a second step, the firm decides on employment levels. In this case, wages remain allocative: wages are settled before employment decisions and therefore profit maximization first order conditions are left unchanged. Consequently, the markup equation remains given by equation (3).

In the efficient bargaining model however, as firm and workers bargain over both wages and employment simultaneously, wages differ from the marginal revenue of labor. Crépon, Desplatz and Mairesse (2002) and Dobbelaere (2004), among others, give empirical support in favor of the efficient against the right-to-manage model. Appendix 2 proves that in this case, omitting the subscripts, the markup equation and the PCM becomes respectively:

$$pY = \frac{m/r}{1+g.(m/r-1)}.(wN + qI) \tag{10}$$

$$PCM \equiv \frac{pY - (wN + qI)}{pY} = (1-g).\left(1 - \frac{r}{m}\right) \tag{11}$$

where g is the bargaining power of workers. One can easily interpret these equations. The PCM is seen from the point of view of the firm paying the wage *w*, which includes the rents kept by workers. It refers therefore to the share kept by the firm, hence the term $(1-g)$.[5] Equation (11) reveals that the changes in the PCM over time are determined by changes in both the markup *and* the bargaining power. Indeed, by differentiating it, one gets:

$$\Delta PCM = (1-g).\frac{r}{m}.\frac{\Delta m}{m} - \left(1-\frac{r}{m}\right)\Delta g \qquad (12)$$

Correcting equation (6) to take into account the bargaining power of workers and using equation (11) lead to the general expression of the PCM at sector level:

$$PCM_j = (1-g_j).\,r_j.\left(\frac{1}{s_j} + \left(\frac{1}{s} - \frac{1}{s_j}\right) g_j.H_j.(1-q_j)\right) + (1-g_j).(1-r_j) \qquad (13)$$

remembering that g_j is a conjectural variation parameter.

2.3 Price rigidities

At the macroeconomic level, for the period under study, the oil price shocks have had major impacts on observed markups resulting in distortions of value-added sharing between factor shares and profits. Among numerous reasons are: unexpected price developments, wage indexation, price stickiness, adjustment costs, terms of trade effects. It is well known that for continental Europe, especially France and Italy, wage indexation during the two oil price shocks resulted in an increased labor share and a squeezing of corporate profits and markups.

A price shock will impact markups if there are rigidities in the sense that prices are slow to adjust to changes in nominal marginal costs. To understand this better, assume that output price p_t for time t adjusts to the desired level p_t^* according to $p_t = (1-b).p_t^* + b.p_{t-1} \Leftrightarrow p_t \approx p_t^*.(1-b.p_t)$, where b is an indicator of the rigidities and p_t is the inflation rate. Because of price rigidities, the measured PCM differs from the desired level, PCM^*, given by (5) or (13), is negatively related to inflation and more so, the slower the prices adjust:

$$PCM \equiv \frac{pY-(wN+qI)}{pY} \approx 1 - \frac{(wN+qI)}{p^*Y}.(1+b.p) = PCM^* - b.(1-PCM^*).p \qquad (14)$$

[5] The straightforward implication is that when labor market imperfections are ignored, as is the case in most markup estimates, the degree of product market imperfection, as represented by markup over marginal cost, is under-estimated, and even more so the greater the bargaining power.

Studying eight OECD economies, Banerjee and Russell (2001) establish a negative long-run relationship between inflation and markup. The interested reader will find in this article detailed references, both theoretical and empirical, supporting this result.

3. Empirical specification

3.1 Sectoral and labor market data

Manufacturing data at sector level is taken from the OECD STAN database. This unbalanced panel covers twenty-three sectors at two-digit level (ISIC Rev.3) for seventeen countries between 1970-2003. The prime goal of this study is to assess the impact of international trade on PCMs. The PCM variable, defined by equation (4), is calculated assuming that the variable inputs are labor and materials. This corresponds exactly to the definition given by Schmalensee and is the standard approach followed, among others, by Domowitz et al. and in most of the studies surveyed by Tybout (2003).

Tables 3a and 3b give the average level and the average change over the period in the PCM, for each country and sector respectively. Markup trends were the prime focus of Boulhol (2005). Here, we just underline that the average PCM over the sample is 0.116, that there is no average decrease in PCMs, but rather a strong heterogeneity of changes between both countries and sectors, as the standard deviation states.

The variable *IMPRATIO* is the import penetration ratio q defined in the preceding section. Exports might also have an impact on the PCM essentially through two different channels. First, firms naturally orientate their production to the higher PCM markets, hence a direct positive relationship between exports and PCMs. Second, the recent literature on firm heterogeneity, especially Melitz (2003), suggests that *exports* could force out the least efficient firms. To the extent that the surviving firms have higher than average markups, the reshuffling of production within sectors due to exports could lead to an increase in the PCM. The variable *EXPRATIO* is defined as the ratio of exports to the sum of domestic production and imports.

Labor markets have changed profoundly over the last thirty years and, as shown above, the workers' bargaining power is an important determinant of PCM. Therefore, two labor market indicators are used from the Labour Market Institutions Database assembled by Nickell and Nunziata (2001): *EP* is the employment protection legislation index scaled on a (0;2) range, and *UDNET* is net union density.[6]

Hoekman, Kee and Olarreaga (2001) found that stock market capitalization has a significant positive impact on average industry markups. They consider that financial deepening reduces the cost of capital, thus increasing the overall profitability of the economy. Within the theoretical framework detailed above, another way through which financial deepening may impact on PCMs is by weakening the workers' bargaining power. Sub-section 4.2. comes back on the channel through which financial deepening may influence PCMs. To take this effect into account, the logarithm of stock market capitalization as a share of GDP, *LOGCAPIT*, is included in the regressors.

Finally, in order to control for price developments according to (14), the change in the GDP deflator, *DEFL*, is included in the regressors.

3.2 Cyclicality of markups

Because of its importance in the drawing up of macroeconomic policies, abundant literature deals with the cyclicality of markups, but whether markups are pro- or contra-cyclical remains unresolved. The cyclicality is mostly due to mismeasurement of factor services and, in order to control for cycles, two variables are introduced. At sector level and following Bils (1987), the de-trended annual change in the logarithm of employment, *EMPCYC*, is computed using a Hodrik-Prescott filter. At the country level, the output gap, *GAP*, from the OECD 2003 Economic Outlook, is used.

3.3 Econometric specification

The preceding discussion suggests a static specification of the form:

$$PCM = f\,(IMPRATIO, EXPRATIO, EP, UDNET, LOGCAPIT, DEFL, GAP, EMPCYC)$$

[6] The data for about half of the countries ends in 1995, and extends to 1998 for the rest. However, as highlighted by the most recent data available (OECD Employment Outlook, 2004, Chapter 2), employment protection legislation has not changed much between 1998 and 2003.

However, past PCM will likely show up as a determinant of current PCM. Consequently, a representation including a lagged dependent variable is preferable. The most common specification is the partial adjustment model, where *i*, *j* and *t* stand for country, sector and time respectively:

$$\begin{aligned} PCM_{ijt} = r.PCM_{ijt-1} + a.IMPRATIO_{ijt} + b.EXPRATIO_{ijt} + c.EP_{it} + d.UDNET_{it} \\ + e.LOGCAPIT_{it} + f.DEFL_{it} + g.GAP_{it} + h.EMPCYC_{ijt} + e_{ij} + u_{ijt} \end{aligned} \quad (15)$$

where e_{ij} is a (country x sector) effect, potentially correlated to RHS variables, and u_{ijt} is assumed to be an i.i.d. residual.

The panel is composed of 6403 observations split among 298 (country x sector) couples. Within this setting, as is well known, the Least Squared Dummy Variables estimator (LSDV) is biased for finite time dimension of the panel. Therefore, to get rid of the effects, e_{ij}, transformation of the data is required. The most common transformation is first-differencing but, in this case, the first difference of the lag dependent variable should be instrumented due to the correlation with the residual first difference. To check the robustness of the estimates, the following estimators are computed. AHL is the Anderson and Hsiao (1982) estimator using the second and third lags of PCM in level as an instrument and by taking into account the MA(1) structure of the differenced residuals.[7] Efficiency could be improved substantially by using a broader set of moment conditions. GMM is the Arellano and Bond (1991) one-step estimator using three lags as instruments in block diagonal form.[8]

Another attractive transformation is orthogonal deviation. Arellano and Bover (1995) showed that the OLS estimate on the orthogonal transformation was the LSDV, and that the transformed residuals were i.i.d. under the above assumptions. AHL estimator on the orthogonal transformation is denoted AHL-ORTH. Reciprocally, GMM-ORTH is the 2SLS estimator on the orthogonal transformation using the same valid instruments as GMM. Specifications including further lags in the dependent and explanatory variables are also tested.

[7] This instrument ought to be preferred to the lag of the first-difference (Arellano and Bond, 1991).

[8] Two-step GMM estimators using Windmeijer finite sample correction from Roodman (2003) were also computed, but the results are not reported as they are very close to one-step estimates.

3.4 Endogeneity of international trade

As much as domestic exporters are attracted to high-markup foreign markets, the greater the domestic markup the more foreign firms might export to the domestic market. In other words, the export decisions of foreign firms create a *positive* relation between markup and imports, hence a classical simultaneity problem. Therefore, estimators that do not take into account the endogeneity of the import variable are likely to underestimate the pro-competitive effect.

Along the same lines, high domestic markups could act as a disincentive for the export decision of domestic firms. As a result, the positive relation between exports and markups, as discussed above, will be underestimated if the export variable is treated as exogenous. The first three lags of trade variables which are valid instruments will be used. More precisely, in the first-difference specification as an example, $IMPRATIO_{t-2}, IMPRATIO_{t-3}$ and $IMPRATIO_{t-4}$ will serve as instruments for $(IMPRATIO_t - IMPRATIO_{t-1})$ and similarly for $EXPRATIO$, in vector form or in block diagonal for AHL or GMM respectively.

3.5 Omitted variable bias

As was established in equation (6), PCM is negatively related to the domestic intensity of competition. As domestic product market deregulation has accompanied trade liberalization over the last decades, omitting variables reflecting the intensity of competition might bias the pro-competitive effect of international trade upwards.

This issue will be addressed in three ways. First, the sensitivity of the estimates will be assessed by including the product market regulation index available for years 1978, 1982, 1988, 1993, 1998 (Nicoletti, Scarpetta and Boylaud, 1999) and 2003 (Conway, Janod and Nicoletti, 2005). The *PMR* variable is constructed by linearly interpolating between those dates.[9] The series is built on a 0-6 scale. *PMR* ranges, for the 17 countries, from 4 (USA) to 6 (France) in 1978 and from 1.0 (Australia,

[9] Conway et al. made some corrections to the previous series, however the changes are very limited as the authors explain, page 10. Moreover, the *scaling* differs from that of Nicoletti et al. For 1998 where a direct comparison is possible, the linear correlation coefficient between the two series is 89% for the 17 countries in our sample. The old series regression to the new one gives: *OLD = 1.726.NEW – 0.540.* This relation is used to derive the 2003 series, consistent with those of Nicoletti et al.

United Kingdom) to 2.7 (Italy) in 2003. Therefore, the changes clearly reflect a deregulation trend, mostly common to the countries in the sample. Secondly, trade variables lagged *3*, *4* and *5* will be tested as instruments in case the second lag is correlated with residuals. Finally, the validity and the relevance of the instruments will be tested.

4. Results

The previous section has put forward two important issues for the empirical analysis, the dynamic nature of the specification and the endogeneity issue of trade variables. These are now dealt with in turn to separate their specific impact.

4.1 Persistence of the dependent variable

Table 4 provides the estimates when trade is treated as exogenous. The main focus here is on the lagged dependent parameter r. The LSDV estimates, in the first column, is known to be biased even if the cross-section dimension - 298 in our case - becomes very large, but the bias here might not be too severe as the average time period is slightly above 21 observations.[10] Even with this caveat, LSDV points to strong persistence with an estimate of $r = 0.71$. This is confirmed by AHL-ORTH and GMM-ORTH, which give higher estimates, although not significantly different. One may infer that, given the size of the panel, the biased coming from its dynamic characteristic is not too serious.

Note the gain in efficiency between these estimates based on orthogonal deviation and first-difference estimators, AHL and GMM. This is particularly striking between both Andersion-Hsiao estimators, based on the second and third lags only. Arellano and Bover (1995, p.40) showed that estimators do not depend on which transformation is used, provided that the instruments are block diagonal and that the instruments used for period *t* are maintained for subsequent periods. Neither of these conditions are met here because each exogenous variable is used for instrumenting as *one* vector, and because maintaining all lags would create far too many moments.

[10] For the lag parameter, Judson and Owen (1999) estimate that the bias could be as high as 20% for T = 30.

Moreover and importantly, the rejection of the overidentifying restrictions from the Sargan-Hansen test, except for AHL, points to misspecifications, which essentially come from the endogeneity of trade, as shown below. Keeping this in mind, the imports parameter is significant whereas the exports one is not, and the long-term sensitivity of PCM to the import ratio ranges from *-0.10* to *-0.45*.

4.2 Treating trade as endogenous

This subsection highlights the importance of accounting for the endogeneity of trade variables. The lagged dependent parameter is not too affected by the addition of trade instruments, as the results presented in Table 5a indicate. It ranges from *0.54* for AHL on first differences to *0.70* for AHL-ORTH.

Validity of the specification

The first test is the Sargan-Hansen test of overidenfying restrictions, which generally tends to over-reject the validity of the instruments. However, a large number of weak instruments might lead to under-rejection (Sevestre, 2002). With only five excluded instruments, AHL estimators are almost immune to this risk. Moreover, for the equation in first-difference, the GMM estimator using one lag only as instrument, GMMa, is reported in the second column, and the one with three lags, GMMb, in the third column.

At the 5% level, and in contrast to the results in Table 4, the Sargan-Hansen test no longer rejects the validity of the instruments for the five estimators in Table 5. However, the probability falls to 0.07 for GMMa. Therefore, the good news is that the two AHL estimators seem reliable based on this test. On the other hand, the fact that GMMb does not reject the null with 185 additional restrictions compared to GMMa, which almost rejects it, puts the validity of the broader set of instruments into serious doubt.

To investigate this issue further, statistics for the first-stage regressions are presented in Table 5b. Bound, Jaeger and Baker (1995) remind us that the presence of weak instruments biases the estimates towards OLS in finite samples. Consequently, BJB suggest that partial R-square and F-statistic be reported routinely, to help diagnose weak instruments, and Stock and Yogo (2002) formalize what the notion of weak instrument means. More precisely, based on the number of excluded instruments, they compute the value of the F-statistic above which the bias of the IV estimate is not greater than say 10% of the OLS bias, at a 5% significance level for instance. The rule of thumb of Staiger and Stock (1997) of 10 for the F-stat is therefore refined but still holds reasonably well. However, when there is more than one endogenous regressor, Shea (1997) warns that the F-stats are insufficient in case of strong correlation between the instruments. To detect the problems that might be generated by this type of correlation, the comparison between the standard partial R^2 (BJB, second column in table 5b) and Shea partial R^2 (first column), which takes the intercorrelations among the instruments into account, is useful. As indicated by Baum, Schaffer and Stillman (2003), when these two measures are close to each other, then the correlation of the instruments is low enough, not to be a source for concern.

Based on the upper panel of Table 5b, the limited set of instruments for the two AHL estimators display an F-stat far above the 10 threshold in both cases, even if the discrepancy between the two partial R^2 mitigates somehow the power of this test. Reading the table vertically from the upper to the lower part reveals that adding a large number of instruments, even though it increases the fit of the first-stage regressions, actually deteriorates the F-stat. From Stock and Yogo's Table 1, one cannot reject the possibility that the bias of these GMM estimators be as much as 25% of the OLS bias (OLS estimates are reported in the first two columns of table 4). In other words, even if the GMM estimators seem to respect the orthogonality conditions, first stage statistics call into question the relevance of the broader set of instruments.

For the equation in first differences, the two auto-correlation statistics (middle part of table 5a) validate the specification: strong first-order correlation that is dealt with by the Arellano-Bond estimator, no significant second-order correlation. For the orthogonal transformation equation, residuals are supposed to be i.i.d. This is only partially confirmed by the tests. Although the absence of first-order correlation is accepted, the m2 statistic detects second-order correlation. Sub-section 4.3 will show that this shortcoming is not present at usual significance level for other specifications giving similar results.

In summary, the two AHL estimators are the more reliable. However this comes at the cost of less precise estimates. The three GMM estimates might rely on less relevant instruments but, as will be shown now, the five estimators lead to close estimates, except for the labor market parameters. Let us now turn to the long term impact of the explanatory variables.

Cycles

Cycle effects are very significant and robust across the different estimators. PCM is found to be pro-cyclical at sector level, as a rise of 1% of cyclical employment induces a decrease of between 0.001 and 0.002 in the PCM. On the other hand, PCM appear to react positively to the whole country cycle: an increase of 1% of GDP in the output gap entails a decrease of 0.002 / 0.003 in the PCM. These results are consistent with those of Boulhol (2005), obtained from a different methodology, and similar in magnitude. As suggested in this related study, there may be a supply-driven counter-cyclical partial equilibrium effect, consistent with most empirical findings (Bils, 1987, Rotemberg and Woodford, 1999, Oliveira Martins and Scarpetta, 2002, among others) dampened by a pro-cyclical general equilibrium one, consistent with the pro-cyclicality of total profits.

Prices

As expected, inflation tends to reduce PCM. The parameter on the change of the GDP deflator is highly significant and robust across estimators. A value of around -0.20 means that b from subsection 2.3 is around 0.23 on average, and indicates that a decrease of 1% in the GDP deflator triggers an increase of 0.002 in the steady-state PCM.

International trade

Import penetration is significant at 1% for all the specifications. As expected from the discussion in Section 3, comparison of Tables 4 and 5 confirms that treating trade as exogenous leads to a strong underestimation of its effect on PCM. Depending on the estimator, the *IMPRATIO* long-term parameter ranges from -0.43 to -0.75. Consistently with the preceding discussion, adding more instruments tend to lower the impact, driving the estimates towards OLS. An increase of one percentage point in the import penetration ratio lowers the PCM by around 0.005 on average.

Export intensity has a positive effect on PCM, although the *EXPRATIO* variable is not always significant. In magnitude, the effect from exports is around a third in the opposite direction of the one found for the pro-competitive effect of imports.

Stock market capitalization

The market capitalization variable, *LOGCAPIT*, is significant at the 5% level for most of the estimators. A doubling of the capitalization is associated with an increase of around 0.005 in the PCM. This is consistent with the findings by Hoekman et al. (2001). According to them, the channel of this financial deepening effect is a lowering of the cost of capital, which increases overall profitability. It is not very clear, however, why this decrease in factor cost will not be passed on to customers, except of course if market power increases. Moreover, if capital is fixed, a decrease in the user cost does increase profitability, but this will not show up in the PCM computed without taking into account capital costs.[11] Another possible channel could link financial market development to the weakening of workers' bargaining position, through increased capital mobility.

Labor market

The two labor market indicators are not significant in the first-difference specification, but are in the orthogonal deviation one. Orthogonal deviations might capture long-term effects better, especially when there is strong inertia in the data, as is the case with the employment protection variable, *EP*. In line with its link to workers bargaining power, a decrease in union density leads to an increase in PCM. When significant, a decrease of 1 percentage point in union coverage entails an increase of 0.0013 in the PCM.

Moreover, the *EP* parameter does not have the a priori – at least mine – expected sign. An increase in employment protection is associated with higher PCM. Dobbelaere (2004) finds, from a study of Belgian firms, that higher bargaining power is associated with higher *markups*. Indeed, wages do not capture all the employment cost and, in particular, more protection may increase firing costs. However,

[11] Another tempting explanation, especially for the nineties', links M&A activities with both the rise in stock prices and the increase in market power. This is clearly a mechanism linking markups and market capitalization positively. However, we focus here on the impact of total capitalization on sectoral PCMs. Moreover, if this were the operating channel, treating market capitalization as endogenous would probably leads to higher estimates, which is not the case as mentioned below.

it is uncertain what the overall effect on the *PCM* is. From Section 3, we infer that there would be two conflicting effects of employment protection on the PCM, one direct and negative through bargaining power, and the other indirect and positive through markup. Employment protection could be positively linked to the PCM, if it reflects non-wage costs rather than bargaining power.

Product market deregulation

Another possibility is that the *EP* captures the effect of an omitted correlated variable, like product market regulation. Therefore, estimates are run by adding the *PMR* variable and, Table 6 reports the results, repeating therein the third and fifth columns from Table 5a to facilitate comparison. As expected from the theoretical model, product market deregulation reduces PCMs and is moreover significant at the 5% level. A one point drop in the *PMR* index induces a decrease of around 0.008 in the PCM. Furthermore, adding the *PMR* variable has three main effects. Firstly, the pro-competitive effect of imports is slightly reduced in both specifications, albeit not significantly. This is not surprising since the *PMR* index includes both inward- and outward-oriented policy features. More specifically, tariffs have a weight of 9% in the construction of the overall index (Conway et al., Fig.1). Secondly, the impact of the *EP* variable is diminished and becomes insignificant even in the orthogonal deviation case. Finally, both the impact of the financial market development and its significance are increased.

4.3 Other robustness checks

The second to fourth lags of trade variables were included above in the instruments. This passed the overidentification test successfully. To further strengthen this result, estimates were computed by replacing the second lag by the fifth, keeping the third and fourth. Table 7 reports the results for the two transformations of the data. They are indeed very close to their respective counterpart presented in the third and fifth columns of Table 5a.

Although the partial adjustment specification is common, it is also restrictive. A more complete autoregressive distributed lag model was tested, by including the second lag of the dependent and the first lag of trade variables as explanatory variables. To save space, the results are not presented here. The precision is much poorer than for the partial adjustment model, probably because of multicollinearity. In addition, long-term sensitivities are very comparable, except for trade and country cycle parameters, which are roughly halved. All in all, compared to the partial adjustment, this more complete model does not add valuable information and loses in precision. As for the results in Table 7, the assumption of no second-order correlation is accepted even for the orthogonal deviation case.

Despite the fact that labor market indicators, market capitalization and inflation are taken at country level, the endogeneity of these variables might still be problematic. Second and third lags were used as instruments, which passed the Sargan-Hansen test. Also, the results were extremely close to the one obtained when treating these explanatory variables as exogenous.

4.4 Are these numbers large?

The Table below broadly summarizes our results.

	Long-term sensitivity of the price-cost margin	Significance
Imports	-0.7 / -0.4	High
Exports	0.15	Medium / Low
Employment Protection	0 / 0.04	Low
Union Density	-0.15 / 0	Medium
Product Market Regulation	0.008	Medium
Market Capitalization	0.01	Medium
Inflation	-0.2	High
Country Cycle	0.2 / 0.3	High
Sector Cycle	-0.2 / -0.1	High

Are these numbers large? For the pro-competitive effect of imports, a centre estimate of -0.5 is as large as it could be. Indeed, given the simulations presented in Table 2, it is consistent only with high-differentiated goods, high concentration and fairly weak domestic competition.

However and more generally, the quantitative effects detailed in Subsection 4.2 might seem low. This impression is misleading in the retrospective of the tremendous changes OECD economies have gone through, from the seventies. Table 8 indicates, in the upper part, the changes over the period of the non-cyclical variables for each country, using trade at the whole manufacturing level for illustration purposes. For instance, on average across countries, stock market capitalization as a percentage of GDP has been multiplied by six, and inflation has receded by five percentage points. The comparison of the average change and the average absolute change illustrates that the trends are mostly common to OECD countries, except for the labor market evolutions. Indeed, there is no average change in union density, whereas the absolute change is 12 percentage points on average.

The lower part of the table applies the GMM1-ORTH estimates of Table 6 to these changes, in order to give some order of magnitude of the impacts on the PCM. Four main lessons can be drawn. First, the average effect across countries of the increase in imports is to reduce the PCM by 0.042. This is very large indeed, given that the average PCM is around 0.12. Second, measures taken to deregulate domestic product markets are estimated to contribute further to the lowering of PCMs, as the average impact from the *PMR* variable is -0.017. Third, these pro-competitive effects are countervailed by the combination of increased exports, financial market development and disinflation, which overall impacts are 0.021, 0.021 and 0.010 respectively. Fourth, the average *absolute* effect due to the joint labor market variables is 0.021, 0.018 coming from the changes in the union participation. This is also large, even though the situation is very heterogeneous between countries.

Finally, although the methodologies differ, the estimate of the pro-competitive effect of imports is similar to that found by KH and CIS, discussed in the Introduction. Indeed, these two studies estimate that the sensitivity of the markup to the logarithm of the ratio of imports to production, $m = q/(1-q)$, is around 0.1. From $\frac{\partial PCM}{\partial q} = \frac{\partial PCM}{\partial m} . \frac{\partial m}{\partial Logm} . \frac{\partial Logm}{\partial q} = \frac{\partial m}{\partial Logm} . \frac{r}{m^2} . \frac{1}{q.(1-q)}$, we infer with constant return to scale and average values, $m = 1.1$ and $q = 0.3$, that KH and CIS estimates are consistent with a sensitivity of the PCM to the import ratio q of -0.39, very close to our centre estimates.

5. Conclusion

This study analyses the determinants of price-cost margins at sector manufacturing level for OECD countries between 1970 and 2003. An increase of one percentage point in the import penetration ratio is estimated to lower the PCM by around 0.005. This is a large effect, as it means that, on average across countries and for the whole manufacturing industries, imports contributed to a decrease of 0.042 in the PCM over the period, from an average level of around 0.12. In addition, domestic product market deregulation has lowered the PCMs. However, these pro-competitive effects are countervailed by the impacts of exports, financial market development and disinflation.

Despite the promising avenues it opens, the burgeoning theoretical literature on firm heterogeneity has not yet unveiled the channel through which exports might increase PCMs. Indeed, in Bernard et al. imports drive the reshuffle and in Melitz (2003), exports influence market structure but with constant markups.

The positive impact of financial deepening on markups was pointed out by Hoekman et al. (2001). The explanation they propose through lower cost of capital is not very convincing, as discussed earlier. One suggestion links financial market development, capital mobility and the weakening of workers' bargaining power. Understanding better the mechanisms through which financial deepening impacts PCMs is a promising direction for further research.

Moreover, deunionization is estimated to be negatively related to PCM, as a decrease of ten percentage points in union participation might trigger an increase of around 0.016 in the PCM. However, because of the strong heterogeneity of labor market institutional changes between countries, the average effect of labor market trends across countries is not meaningful.

These results put the textbook version of the pro-competitive effect into the perspective of the important macro-economic trends OECD economies have gone through. They obviously have important consequences for the analysis of welfare and the distribution impacts of globalization.

Appendix 1: Expression of the Price-Cost Margin in the case of a differentiated good, heterogeneous firms and conjectural variations

Maximization of utility by the representative agent can classically be achieved in two steps. For a given good *j*, consumptions of two varieties *k* and *l* are related according to:

$$p_{jk} = p_{jl}.(C_{jk} / C_{jl})^{-1/s_j} \qquad (A1)$$

which leads to the familiar Dixit-Stiglitz expression for any variety *l*:

$p_{jl}.C_{jl} = \left(p_{jl}^{1-s_j} / \sum_k p_{jk}^{1-s_j} \right).P_j.C_j$, where the price index of good *j* is given by $P_j = \left(\sum_k p_{jk}^{1-s_j} \right)^{1/(1-s_j)}$.

In a second step, utility is maximized between the different goods, and first-order conditions lead to:

$C_j = C_i.\left(\frac{P_i / a_i}{P_j / a_j} \right)^w$ from which we infer the consumption share of sector *j*:

$$P_j.C_j = \sum_k p_{jk}.C_{jk} = R.\frac{a_j^s.P_j^{1-s}}{G(p)^{1-s}} \qquad (A2)$$

where R is total revenue and $G(p) = \left(\sum a_j^s.P_j^{1-s} \right)^{1/(1-s)}$ is the general price index. Using equation (A1), (A2) becomes:

$$p_{jl}.C_{jl}^{1/s_j}.\sum_k (C_{jk})^{1-1/s_j} = R.\frac{a_j^s}{G(p)^{1-s}}(p_{jl}.C_{jl}^{1/s_j})^{1-s}.\left(\sum_k (C_{jk})^{1-1/s_j} \right)^{\frac{1-s}{1-s_j}}$$

, which simplifies into:

$$(p_{jl}.C_{jl}^{1/s_j})^s = R.\frac{a_j^s}{G(p)^{1-s}}.\left(\sum_k (C_{jk})^{1-1/s_j} \right)^{\frac{s_j - s}{1-s_j}}$$

Using market clearing conditions: $C_{jk} = Y_{jk} \ \forall k$, this equation implicitly gives the demand faced by firm *l* in function of its price and the production of the other varieties of the same good. Differentiating this expression with respect to Y_{jl}, at constant revenue and by ignoring the impact on the overall manufacturing price index, leads to:

$$\frac{1}{p_{jl}}.\frac{\partial p_{jl}}{\partial Y_{jl}} + \frac{1}{s_j.Y_{jl}} = -\frac{s_j - s}{s_j.s}.\frac{\sum_k (Y_{jk})^{-1/s_j}.\frac{\partial Y_{jk}}{\partial Y_{jl}}}{\sum_k (Y_{jk})^{1-1/s_j}}$$

Using again equation (A1) at equilibrium and rearranging gives:

$$\frac{Y_{jl}}{p_{jl}}.\frac{\partial p_{jl}}{\partial Y_{jl}}=-\frac{1}{s_j}-\left(\frac{1}{s}-\frac{1}{s_j}\right)\frac{\sum_k p_{jk}.\frac{\partial Y_{jk}}{\partial Y_{jl}}}{\sum_k p_{jk}.Y_{jk}}.Y_{jl}=-\frac{1}{s_j}-\left(\frac{1}{s}-\frac{1}{s_j}\right)x_{jl}.\sum_k \frac{p_{jk}}{p_{jl}}.\frac{\partial Y_{jk}}{\partial Y_{jl}}.(1-q_j) \qquad \text{(A3)}$$

where x_{jl} is the share of firm *l* in sector *j* domestic output and q_j is the import penetration ratio of sector *j* defined as the ratio of imports over the sum of imports and domestic production. Classically, profit maximization for a firm producing the variety *l* of good *j* gives the expression linking the markup to e_{jl}, the price-elasticity of the demand faced by the firm: $\frac{1}{m_{jl}}=1-\frac{1}{e_{jl}}\equiv 1-\frac{Y_{jl}}{p_{jl}}.\frac{\partial p_{jl}}{\partial Y_{jl}}$. From (A3), we derive the PCM:

$$PCM_{jl}=1-\frac{r_j}{m_{jl}}=(1-r_j)+\frac{r_j}{e_{jl}}=(1-r_j)+r_j.\left[\frac{1}{s_j}+\left(\frac{1}{s}-\frac{1}{s_j}\right)x_{jl}.\sum_k \frac{p_{jk}}{p_{jl}}.\frac{\partial Y_{jk}}{\partial Y_{jl}}.(1-q_j)\right]$$

Aggregating the PCMs at the domestic sector level leads to the expressions in equations (5) to (8).

Appendix 2: Efficient bargaining

With g being the bargaining power of workers and w_u the reservation wage, the objective function being maximised in the Nash-bargaining process is classically:

$$\Pi^{1-g}[(w-w_u).N]^g \equiv [pY-(wN+qI)]^{1-g}[(w-w_u).N]^g .$$

The first order conditions with respect to factor levels are:

$$(1-g).\frac{\frac{p}{m}.\frac{\partial Y}{\partial N}-w}{\Pi}+\frac{g}{N}=0 \Leftrightarrow p.\frac{\partial Y}{\partial N}=m.\left(w-\frac{g}{1-g}.\frac{\Pi}{N}\right)$$

and $$p.\frac{\partial Y}{\partial I}=m.q$$

Euler's equation leads to:

$$r.pY=m..(wN+qI-\frac{g.\Pi}{1-g})\Leftrightarrow r.pY=m.(pY-\frac{\Pi}{1-g})\Leftrightarrow L\equiv\frac{\Pi}{pY}=(1-g).(1-\frac{r}{m})$$

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Table 1: Extract from Question 10 of European Commission (2003)

Q10: For each of the following actors, tell me if it has/ they have … on the process of globalisation.

	Too much influence	Just the right level of influence	Not enough influence	DK&NA
Trade unions	15%	23%	**55%**	6%
Financial circles	**59%**	23%	11%	7%
Consumer associations	8%	22%	**66%**	5%
Multinationals	**62%**	21%	11%	5%

Table 2: Sensitivity of the pro-competitive effect to intensity of competition (*g*), concentration (*H*), elasticity of substitution between varieties (s_j) .*

$$\partial PCM_j / \partial q_j = -r_j.(1/s - 1/s_j).g_j.H_j$$

(simulation with $s = 1$ and $r_j = 1$)

		$s_j = 2$			$s_j = 8$		
		Herfindahl index *H*			Herfindahl index *H*		
		0.1	0.2	0.5	0.1	0.2	0.5
Conjectural variation g	0.1	*-0.01*	*-0.01*	*-0.03*	*-0.01*	*-0.02*	*-0.04*
	0.5	*-0.03*	*-0.05*	*-0.13*	*-0.04*	*-0.09*	*-0.22*
	1	*-0.05*	*-0.10*	*-0.25*	*-0.09*	*-0.18*	*-0.44*

Denotations: PCM is the price-cost margin, q the import ratio, r the returns to scale, s the elasticity of substitution between different goods.

(*) reading: When competition is Cournot ($g = 1$), the Herfindahl index is 0.2 and the elasticity of substitution between varieties is 8, an increase of 1 percentage point in the import penetration ratio reduces the PCM by 0.0018.

Note that these numbers are calculated under perfect labor market. From equation (11), with a bargaining power say of 0.2, these shall be multiplied by 0.8.

Table 3a: Average level and average change in the Price-Cost Margin across sectors over the period (unweighted) *

	Level		Change	
	Average	Standard-deviation	Average	Standard-deviation
Australia	0.131	0.051	0.026	0.052
Austria	0.123	0.031	0.070	0.085
Belgium	0.107	0.031	0.001	0.025
Canada	0.120	0.041	0.069	0.031
Denmark	0.103	0.033	0.016	0.068
Spain	0.133	0.052	-0.091	0.108
Finland	0.130	0.037	-0.002	0.073
France	0.106	0.035	0.030	0.105
UK	0.106	0.026	0.014	0.065
Germany	0.095	0.037	-0.011	0.047
Italy	0.140	0.049	-0.029	0.053
Japan	0.149	0.045	-0.008	0.070
Netherlands	0.107	0.036	-0.002	0.070
Norway	0.089	0.023	-0.011	0.070
New Zealand	0.148	0.033	0.012	0.041
Sweden	0.098	0.071	0.042	0.065
USA	0.111	0.048	0.023	0.063
Total	0.116	0.044	0.007	0.079

(*) : For the level, the standard deviation is the standard deviation across sectors of the average PCM through time. The change refers for a given (country x sector) to the change in the PCM between the beginning and the end of the period

Table 3b: Average level and average change in the Price-Cost Margin across countries over the period (unweighted) *

	Level		Change	
	Average	Standard-deviation	Average	Standard-deviation
Food and Beverages	0.106	0.021	0.024	0.025
Textiles	0.111	0.028	0.022	0.071
Wearing Apparel	0.110	0.022	0.008	0.057
Leather and Footwear	0.098	0.030	0.034	0.069
Wood and Cork	0.123	0.039	-0.015	0.065
Pulp and Paper	0.137	0.029	0.030	0.060
Printing and Publishing	0.134	0.036	0.028	0.059
Coke, Refined Petroleum	0.113	0.078	0.001	0.176
Chemical	0.161	0.036	0.029	0.049
Rubber and Plastics	0.123	0.023	0.011	0.057
Other non-metallic mineral	0.155	0.035	-0.010	0.060
Basic metals	0.095	0.024	0.010	0.074
Fabricated Metal	0.120	0.024	0.007	0.047
Machinery and Equipment,	0.108	0.024	-0.025	0.064
Office, Accounting and Comp. Mach.	0.117	0.047	-0.087	0.097
Electrical Machinery	0.119	0.022	-0.045	0.078
Radio, TV and Comm. Equip.	0.119	0.058	0.006	0.113
Medical, Precision and Optical	0.120	0.049	0.025	0.066
Motor Vehicles	0.080	0.024	0.027	0.063
Other Transport	0.063	0.047	0.066	0.067
Manuf. Nec and Recycling	0.113	0.057	-0.002	0.056
Total	0.116	0.044	0.007	0.079

(*) : For the level, the standard deviation is the standard deviation across countries of the average PCM through time. The change refers for a given (country x sector) to the change in the PCM between the beginning and the end of the period

Table 4: Determinants of the Price-Cost Margin when trade variables are treated as exogenous

	LSDV	DIFF-MA(1)	AHL	GMM	AHL-ORTH	GMM-ORTH
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Lag (PCM)	0.708***	0.785***	0.539***	0.465***	0.730***	0.746***
	(0.021)	*(0.015)*	*(0.168)*	*(0.112)*	*(0.059)*	*(0.041)*
Import ratio	-0.029***	-0.033***	-0.207***	-0.211***	-0.027**	-0.028***
	(0.009)	*(0.007)*	*(0.050)*	*(0.044)*	*(0.011)*	*(0.010)*
Export ratio	0.006	-0.014**	-0.013	-0.021	0.008	0.006
	(0.009)	*(0.007)*	*(0.028)*	*(0.025)*	*(0.011)*	*(0.010)*
Employment Protection	0.0071*	0.0062***	-0.0059	0.0108	0.0071	0.0071
	(0.0037)	*(0.0020)*	*(0.0080)*	*(0.0089)*	*(0.0052)*	*(0.0046)*
Union Density	-0.032***	-0.013*	0.020	0.002	-0.029*	-0.028*
	(0.010)	*(0.007)*	*(0.046)*	*(0.042)*	*(0.017)*	*(0.015)*
Market Capitalization	0.0005	0.0041***	0.0040*	0.0037**	0.0000	0.0003
	(0.0007)	*(0.0006)*	*(0.0021)*	*(0.0015)*	*(0.0008)*	*(0.0007)*
Inflation	-0.050***	-0.008	-0.063***	-0.093***	-0.051***	-0.050***
	(0.014)	*(0.012)*	*(0.024)*	*(0.018)*	*(0.014)*	*(0.013)*
Output gap	0.026	0.040**	0.115***	0.121***	0.021	0.022
	(0.023)	*(0.016)*	*(0.045)*	*(0.039)*	*(0.022)*	*(0.019)*
Sector cycle	-0.046***	-0.060***	-0.036**	-0.040***	-0.045***	-0.047***
	(0.012)	*(0.010)*	*(0.015)*	*(0.014)*	*(0.008)*	*(0.008)*
Sargan-Hansen test			1.7 (1)	135.9 (92)	7.6 (1)	139.9 (92)
			0.19	*0.002*	*0.006*	*0.001*
m1			-6.7 (0.00)	-7.03 (0.00)	-2.46 (0.01)	-2.13 (0.03)
m2			1.35 (0.18)	0.85 (0.40)	0.78 (0.44)	0.71 (0.48)
Nb Obs	6403	6105	5807	6105	5807	6105
			Long-term sensitivity			
IMPRATIO	-0.10	-0.15	-0.45	-0.39	-0.10	-0.11
EXPRATIO	0.02	-0.06	-0.03	-0.04	0.03	0.02
EP	0.024	0.029	-0.013	0.020	0.027	0.028
UDNET	-0.11	-0.06	0.04	0.00	-0.11	-0.11
LOGCAPIT	0.002	0.019	0.009	0.007	0.000	0.001
DEFL	-0.17	-0.04	-0.14	-0.17	-0.19	-0.20
GAP	0.09	0.18	0.25	0.23	0.08	0.08
EMPCYC	-0.16	-0.28	-0.08	-0.08	-0.17	-0.19

Notes.

(i) The dependent variable is the PCM and the specification is the partial adjustment model of equation (15), with potentially correlated (sector x country) effects. LSDV is the fixed effect estimator and DIFF-MA(1) is the GLS estimator of the equation in first-differences with MA(1) residuals. GMM is the one-step Arellano-Bond estimator, using as instruments the second to fourth lag of the dependent variable in block diagonal form. AHL and AHL-ORTH are the Anderson-Hsiao estimator with instrument in level for the equation in first differences and in orthogonal deviations, respectively. GMM1-ORTH is the GMM estimator for the orthogonal specification using the same set of instruments as GMM.

(ii) In this table, the lag of the dependent variable only is treated as endogenous.

(iii) Asymptotic standard errors, between parentheses, are robust to heteroscedasticity and autocorrelation and computed from Roodman (2003). *, ** and *** indicate significance at 90%, 95% and 99% confidence level, respectively.

(iv) For the Sargan-Hansen test, the J-statistic is reported. The number of excluded instruments is between parentheses, and the probability that the overidentifying restrictions are rejected is reported below.

(v) m1 and m2 are Arellano-Bond tests for first- and second-order correlation. P-values are in parentheses.

Table 5a: Determinants of the Price-Cost Margin when trade is treated as endogenous

	AHL	GMMa	GMMb	AHL-ORTH	GMM-ORTH
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Lag (PCM)	0.536***	0.552***	0.565***	0.699***	0.694***
	(0.060)	*(0.075)*	*(0.053)*	*(0.055)*	*(0.041)*
Import ratio	-0.335***	-0.264***	-0.225***	-0.226***	-0.132***
	(0.147)	*(0.064)*	*(0.047)*	*(0.070)*	*(0.031)*
Export ratio	0.096	0.100**	0.057	0.049	0.037
	(0.111)	*(0.051)*	*(0.039)*	*(0.069)*	*(0.030)*
Employment Protection	-0.0011	0.0091*	0.0032	0.0127*	0.0109**
	(0.0128)	*(0.0087)*	*(0.0081)*	*(0.0074)*	*(0.0055)*
Union Density	-0.001	-0.005	0.002	-0.054**	-0.042**
	(0.038)	*(0.036)*	*(0.032)*	*(0.022)*	*(0.018)*
Market Capitalization	0.0046	0.0039**	0.0039**	0.0035**	0.0020*
	(0.0031)	*(0.0020)*	*(0.0016)*	*(0.0016)*	*(0.0012)*
Inflation	-0.066**	-0.094***	-0.078***	-0.076***	-0.064***
	(0.028)	*(0.021)*	*(0.020)*	*(0.021)*	*(0.016)*
Output gap	0.159***	0.140***	0.131***	0.073*	0.061**
	(0.061)	*(0.041)*	*(0.038)*	*(0.043)*	*(0.026)*
Sector cycle	-0.042**	-0.037***	-0.039***	-0.068***	-0.059***
	(0.018)	*(0.015)*	*(0.014)*	*(0.014)*	*(0.010)*
Sargan-Hansen test	3.0 (5)	113.8 (91)	265.4 (276)	7.8 (5)	260.9 (276)
	0.70	*0.07*	*0.67*	*0.17*	*0.73*
m1	-6.23 (0.00)	-7.73 (0.00)	-6.59 (0.00)	1.74 (0.08)	1.11 (0.27)
m2	1.36 (0.18)	0.98 (0.33)	0.94 (0.35)	2.63 (0.01)	2.03 (0.04)
Nb Obs	5509	6105	6105	5509	6105
			Long-term sensitivity		
IMPRATIO	-0.72	-0.59	-0.52	-0.75	-0.43
EXPRATIO	0.21	0.22	0.13	0.16	0.12
EP	-0.025	0.020	0.007	0.042	0.036
UDNET	-0.02	-0.01	0.00	-0.18	-0.14
LOGCAPIT	0.010	0.009	0.009	0.011	0.007
DEFL	-0.14	-0.21	-0.18	-0.25	-0.21
GAP	0.34	0.31	0.30	0.24	0.20
EMPCYC	-0.09	-0.08	-0.09	-0.23	-0.19

Notes.

(i) See notes to Table 4.

(ii) In addition here, trade variables are treated as endogenous. Lags 2 to 4 of the import and export ratios are used as instruments in block diagonal form. This means, for example, that $q_{t-2}, q_{t-3}, q_{t-4}$ serve as instruments in the first-difference equation for $(q_t - q_{t-1})$ and in the orthogonal deviation equation for

$$(q_{t-1} - (q_t + q_{t+1} + ... + q_T)/(T - t + 1)) \quad .$$

(iii) Second-step estimates give similar results.

(iv) Treating the other explanatory variables as endogenous leads to very comparable results.

Table 5b

Relevance of the instruments

First-stage regressions statistics

	First-Difference			Orthogonal Deviation		
Endogenous Variable	Shea Partial R^2 of excluded instruments	Partial R^2 of excluded instruments	F statistic	Shea Partial R^2 of excluded instruments	Partial R^2 of excluded instruments	F statistic
	AHL – Column (1) in Table 5a			*AHL-ORTH – Column (4) in Table 5a*		
Lag (PCM)	0.066	0.067	12.7	0.185	0.195	52.0
Import ratio	0.012	0.032	22.1	0.022	0.043	23.0
Export ratio	0.010	0.028	14.5	0.035	0.070	26.3
	GMMa – Column (2) in Table 5a			*GMM-ORTH – Column (5) in Table 5a*		
Lag (PCM)	0.080	0.080	3.6	0.319	0.337	6.4
Import ratio	0.062	0.073	5.3	0.129	0.152	4.2
Export ratio	0.063	0.075	6.0	0.187	0.213	3.4
	GMMb – Column (3) in Table 5a					
Lag (PCM)	0.191	0.193	3.8			
Import ratio	0.155	0.157	5.2			
Export ratio	0.166	0.169	4.9			

Table 6: Determinants of the Price-Cost Margin

including product market regulation

	GMMb	GMMb	GMM-ORTH	GMM-ORTH
Lag (PCM)	0.565***	0.557***	0.694***	0.696***
	(0.053)	*(0.051)*	*(0.041)*	*(0.038)*
Import ratio	-0.225***	-0.181***	-0.132***	-0.109***
	(0.047)	*(0.051)*	*(0.031)*	*(0.030)*
Export ratio	0.057	0.071*	0.037	0.047
	(0.039)	*(0.038)*	*(0.030)*	*(0.030)*
Employment Protection	0.0032	-0.0040	0.0109**	0.0080
	(0.0081)	*(0.0077)*	*(0.0055)*	*(0.0056)*
Union Density	0.002	-0.011	-0.042**	-0.049***
	(0.032)	*(0.032)*	*(0.018)*	*(0.018)*
Product Market Regulation		0.0039**		0.0022**
		(0.0018)		*(0.0010)*
Market Capitalization	0.0039**	0.0064***	0.0020*	0.0034***
	(0.0016)	*(0.0018)*	*(0.0012)*	*(0.0012)*
Inflation	-0.078***	-0.069***	-0.064***	-0.058***
	(0.020)	*(0.019)*	*(0.016)*	*(0.016)*
Output gap	0.131***	0.115***	0.061**	0.053**
	(0.038)	*(0.038)*	*(0.026)*	*(0.025)*
Sector cycle	-0.039***	-0.036**	-0.059***	-0.056***
	(0.014)	*(0.015)*	*(0.010)*	*(0.009)*
Sargan-Hansen test	265.4 (276)	264.31 (276)	260.9 (276)	261.3 (276)
	0.67	*0.69*	*0.73*	*0.73*
m1	-6.59 (0.00)	-6.52 (0.00)	1.11 (0.27)	0.62 (0.53)
m2	0.94 (0.35)	0.93 (0.35)	2.03 (0.04)	1.85 (0.06)
Nb Obs	6105	6105	6105	6105
	Long-term sensitivity			
IMPRATIO	-0.52	-0.41	-0.43	-0.36
EXPRATIO	0.13	0.16	0.12	0.16
EP	0.007	-0.009	0.036	0.026
UDNET	0.00	-0.02	-0.14	-0.16
PMR		0.007		0.009
LOGCAPIT	0.009	0.014	0.007	0.011
DEFL	-0.18	-0.16	-0.21	-0.19
GAP	0.30	0.26	0.20	0.17
EMPCYC	-0.09	-0.08	-0.19	-0.19

Notes.

The first and third columns repeat estimates reported in Table 5. The second and fourth columns add the Product Market Regulation index as an explanatory variable, respectively.

Table 7: Determinants of the Price-Cost Margin

Robustness Checks: Further lags for trade instruments

	Further lags for trade instruments	
	GMMb	GMM-ORTH
Lag (PCM)	0.555*** *(0.057)*	0.708*** *(0.037)*
Import ratio	-0.183*** *(0.045)*	-0.081*** *(0.031)*
Export ratio	0.017 *(0.040)*	0.012 *(0.027)*
Employment Protection	0.0029 *(0.0079)*	0.0088* *(0.0052)*
Union Density	0.034 *(0.034)*	-0.037** *(0.017)*
Market Capitalization	0.0043*** *(0.0015)*	0.0015 *(0.0010)*
Inflation	-0.068*** *(0.018)*	-0.057*** *(0.015)*
Output gap	0.099*** *(0.037)*	0.039* *(0.024)*
Sector cycle	-0.035** *(0.014)*	-0.053*** *(0.009)*
Sargan-Hansen test	262.4 (270) *0.62*	257.0 (270) *0.71*
m1	-6.82 (0.00)	-0.21 (0.83)
m2	0.90 (0.37)	1.48 (0.14)
Nb Obs	6105	6105
	Long-term sensitivity	
IMPRATIO	-0.41	-0.28
EXPRATIO	0.04	0.04
EP	0.007	0.030
UDNET	0.01	-0.13
LOGCAPIT	0.010	0.005
DEFL	-0.15	-0.20
GAP	0.22	0.13
EMPCYC	-0.08	-0.18

Notes.

The same notes as Table 5 apply except that for the first two columns, lags 3 to 5 of the trade variables are used as instruments instead of lags 2 to 4.

Table 8: Impact of the tremendous changes in OECD economies on the Price-Cost Margin overall

	Changes in the explanatory variables over the period						
	Import ratio	Export ratio	Employment Protection	Union Density	Product Market Regulation	Stock Market Capitalizat.	GDP Deflator Change
Australia	0.15	0.06	0.00	-0.08	-3.19	1.86	-0.037
Austria	0.16	0.18	0.65	-0.16	-1.92	1.80	-0.022
Belgium	0.19	0.21	-0.18	0.12	-2.62	1.63	-0.028
Canada	0.15	0.13	0.00	0.07	-1.67	2.65	-0.009
Denmark	0.09	0.19	-0.28	0.17	-2.84	1.90	-0.068
Spain	0.19	0.13	-0.36	0.09	-1.48	3.41	-0.165
Finland	0.02	0.15	-0.12	0.28	-3.35	2.82	-0.017
France	0.15	0.15	0.70	-0.12	-2.20	2.64	-0.038
UK	0.21	0.13	0.11	-0.13	-3.39	1.45	-0.054
Germany	0.04	0.11	-0.12	-0.05	-1.77	0.94	-0.003
Italy	0.10	0.11	-0.22	0.02	-1.56	1.94	-0.045
Japan	0.07	0.09	0.00	-0.08	-2.50	0.26	-0.079
Netherlands	0.14	0.23	-0.12	-0.12	-2.22	1.10	-0.030
Norway	0.05	0.06	-0.16	0.05	-2.25	1.86	-0.104
New Zealand	0.10	0.07	0.00	-0.11	-3.74	1.95	-0.108
Sweden	0.07	0.18	0.96	0.23	-2.57	3.18	-0.005
USA	0.15	0.08	0.00	-0.12	-2.71	1.14	-0.030
Average change	0.119	0.133	0.051	0.003	-2.47	1.91	-0.050
Average of *absolute* change	0.119	0.133	0.235	0.118	2.47	1.91	0.050
	Impact of these changes on the PCM across countries(*)						
Minimum	-0.073	0.009	-0.009	-0.045	-0.027	0.003	0.001
Maximum	-0.007	0.036	0.025	0.026	-0.010	0.038	0.032
Average of *absolute* effect	0.042	0.021	0.006	0.019	0.017	0.021	0.010

(*): To assess the impact of each determinant, the changes reported in the upper part of the table are applied to GMM1-ORTH estimates of Table 6.

Figure 1: Price-Cost Margin and Import penetration ratio at manufacturing level

Source: STAN, author's calculations. Variables are defined in the main text